Connections Customer Forum

National Railway Museum York

15 November 2016

Connections Update

November 2016

Mike Hammond

Head of Connections Services

Connections Performance Update – October 2016

Current performance

- BMCS (YTD) NPg 3rd overall (86.1%), Connections 3rd (84.1%)
- Month of September Connections 2nd place – 86.0%
- Av time to Quote – LVSSA&B both outperformed Ofgem max target
- Av time to deliver – LVSSA&B both in midrange of Ofgem target
- ICE – Delivered on 5/22 committed actions + added 9 new ones
- Ofgem on 2015/16 ICE – “we consider that NPG delivered its commitments”

Outputs delivered

- ✓ Shared SMART Grid Innovation Strategy
- ✓ Active Network Management
- ✓ Implemented Export Limiting Devices
- ✓ Jargon Buster to help customers
- ✓ ICP metered disconnections pilot
- ✓ Mid year ICE plan update

Ongoing initiatives

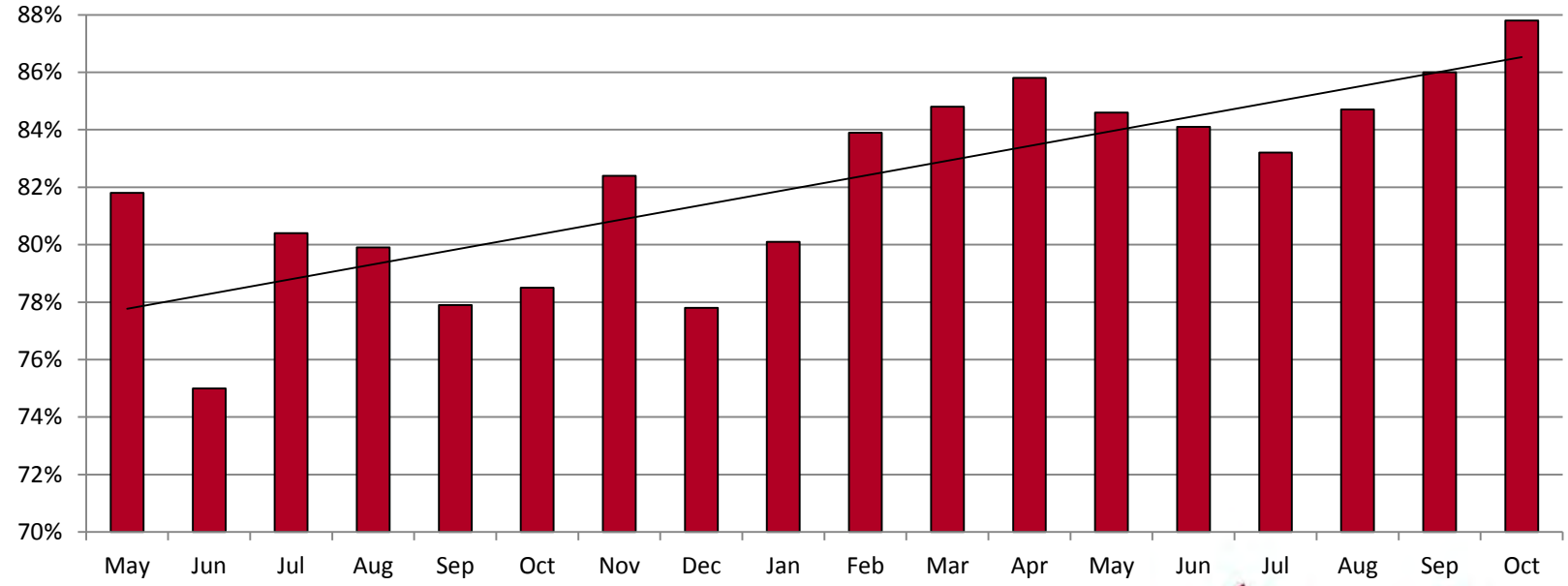
- Customer satisfaction improvement programme, significant transformational change planned for December 2016.
- Development of 2017-18 ICE work plan, continued stakeholder engagement and process change.
- Continue to support Competition in Connections, extending boundaries of contestable works, PFR & disconnections

ED1 environment

- Minor Cons BMCS reward/penalty
- Minor Cons TTC/TTQ reward
- Major works ICE incentive – penalty only
- QMEC consultation ongoing
- Constrained Networks

Connections BMCS scores by month

Month	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16
Connections	78.5	82.4	77.8	80.1	83.9	84.8	85.8	84.6	84.1	83.2	84.7	86.0	87.8
DNO Position	**6**	**5**	**6**	**5**	**4**	**2**	**1**	**3**	**2**	**3**	**3**	**2**	**TBC**



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Ofgem's ICE criteria on constrained networks

Addressing new connection issues in constrained areas, additional criteria questions

- Q9. Where flexible connection offers are available, do you consider that the DNO's work plan for 2016-17 sufficiently addresses concerns about the uncertainty of curtailment levels? For example, do their plans ensure that stakeholders have access to the data they require for an investment decision?
- Q10. Where consortium connections are available, do you consider that the DNO's work plan for 2016-17 reflect requirements for clear and detailed information about where, how and under what conditions such projects can proceed?
- Q11. Where flexible or alternative connections are not currently available in constrained areas, do you consider that the DNO's work plan for 2016-17 either include steps to provide information about when these types of connection will become available? Or that the DNO has justified why these are not available?
- Q12. Do you consider that the DNO's work plans include appropriate engagement to ensure that network investment plans are well communicated to stakeholders, including when new capacity will become available?
- Q13. Do you consider that the DNOs' plans include appropriate activities to improve, where necessary, the provision of information on constrained areas of the network to provide better data about where connections may be viable?
- Q14. Are there particular additional activities or outputs which you consider should be included in the work plan of activities to better facilitate grid connections?

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Energy Policy & Regulatory Outlook

Jim Cardwell

Head of Trading and Innovation

Topics

- Constrained networks
- Quicker more efficient connections
- Charging arrangements for embedded generation
- Transmission/distribution interface
- Assessment & design fees
- Smart flexible energy system
- The Northern Energy Taskforce

Engaging with Ofgem on constrained networks

- Ofgem published consultation on 4 March 2016
- Sought responses by 29 April 2016
- Sought further information from DNOs in May and October 2016 to understand the position nationally
  https://www.ofgem.gov.uk/publications-and-updates/consultation-getting-electricity-connection-when-network-constrained
- In summary
  - Ofgem alerted by a constraint in the South West that has created a connections queue, particularly for new generation
  - Ofgem seeking to understand the national picture and interested in whether DNOs are fulfilling their duties and whether the regulatory framework needs change
  - NPg is in a better position than some other DNOs as the majority of our network is unconstrained

Constrained areas for generation

- The bulk of our substations have spare capacity
  - 2/3 of higher voltage circuits have material capacity for new generators
  - 91% of larger substations can accept 25MW of new generators
- In four locations generators have accepted more flexible and innovative offers instead of paying for upstream reinforcement
  - Blyth – constraint on NGET equipment
  - Seal Sands – constraint on our equipment
  - Driffield – constraint on our equipment (at Driffield and Beverley)
  - Hull East to Roos – single customer constraint on the circuit
- In the past year, flexible connection of 130MW of EHV generation has saved £4m in connection costs

Engaging with Ofgem on Quicker More Efficient Connections (QMEC)

- Ofgem published its update on industry progress on 29 January 2016
- It summarises the progress DNOs have made on the actions Ofgem set out in QMEC September 2015

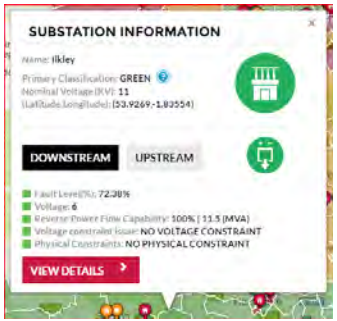
  https://www.ofgem.gov.uk/system/files/docs/2016/01/quicker_and_more_efficient_connections_jan_2016_-_final_29.01.2016_0.pdf
- Key areas of development include:
  - Improved visibility and availability of flexible connections, flexible payment terms and consortia for connecting customers
  - Development of a set of principles and rules for the introduction and enforcement of milestones in connection offers
  - Development of an action plan for industry to progress more effective queue management
  - Ofgem invited DNOs and stakeholders to propose trials that might enable reinforcement to take place in anticipation of future connection customer requirements

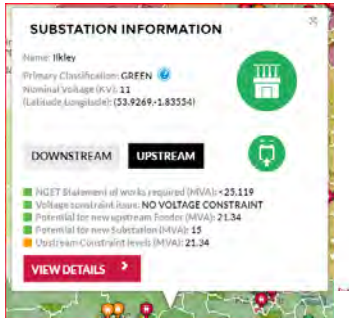
Engaging with Ofgem on QMEC – next steps

- Releasing capacity - reducing the need for reinforcement through discussion with:
  - existing connected customers to relinquish unused contracted capacity
  - customers in receipt of connections offers where the work is not progressing (queue management using milestones principles)
- Progressing trials for investment ahead of need – Ofgem will continue to work with DNOs and stakeholders; and will publish periodic updates

Providing visibility on network capacity

- Our interactive generation and demand heat maps show available capacity
- The heat maps have undergone further development
- Red/amber/green status for capacity by postcode area





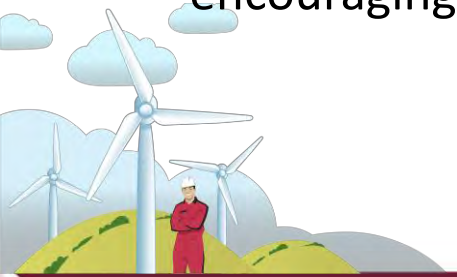
Charging arrangements for embedded generators

- Ofgem published an open letter 29 July 2016
- Sought responses by 23 September 2016

  https://www.ofgem.gov.uk/publications-and-updates/open-letter-charging-arrangements-embedded-generation
- In summary
  - Ofgem thinks that charging arrangements for distributed generation (DG) may be distorting energy markets and that there should be a level playing field for all generators
  - It is concerned about specific payments that these generators receive and also charges that they avoid paying (in respect of transmission grid costs)
  - Much of the discussion is about whether issues such as embedded benefits may be tackled one-by-one or whether a more holistic review is required

Our position on embedded benefits

- As patterns of network usage change and new technologies are introduced, it is important that energy policy keeps pace
- The issue of charging for generators is a growing one and needs to be addressed
- However, unintended consequences from any remedy must be avoided so as not to transfer the market distortion and retain the inequity
- We would therefore welcome a holistic review of any wider distortions in encouraging the efficient development of the energy system



Transmission operators and DNOs working together

- The Transmission Distribution Interface Group (TDI) is meeting quarterly
- A public event is being arranged in the New Year to share progress
  - 15 February 2017 in London and 22 February 2017 in Glasgow
- In summary
  - Ofgem and stakeholders (large generators) are concerned about regional constraints at grid level
  - National Grid highlighting fundamental changes to grid use – fewer large and more small generators
  - Less income from large power stations and DG does not pay transmission charges (embedded generation benefits)
  - Presents issues for load and generation balancing and national supply security
  - Significant effect on NGET income recovery – need to change charging arrangements
  - Policy needs to encourage the efficient development of the whole energy system

TDI work programme

Transmission & Distribution Interface Work Programme	
Active Network Management (ANM)	How can ANM schemes be better co-ordinated between T&D?
Statement of Works	Revising the process to assess when DG requires transmission reinforcement
Shared Services	Establishing a list of DNO services and understanding where these can be compatible with SO services
Whole System Cost Benefit Analysis	Understanding process and data required for CBAs across T&D using a real example of solving High Volts issues on transmission networks, where is the most efficient place to solve the problem? (transmission or distribution)
Co-ordinated Charging Arrangements	Investigate the impact different charging arrangements at T&D have on customers and devise potential solutions to issues

TDI charging taskforce – scope & deliverables

- Scope of works
  - The role of the charging task force is to bring expertise together from various charging fora to think strategically and holistically about the current arrangements – use of system and connection
  - Consider how these arrangements impact customers who connect at distribution level and have a resultant impact on the transmission network
  - To understand what entitlements customers have in return for charges
- Deliverables
  - To identify any problems caused for UK customers through the interaction of current commercial arrangements across transmission and distribution on customers – September 2016
  - To succinctly capture the root causes of these problems – December 2016
  - To capture a range of high level options which could solve the issues identified – April 2017
  - To highlight the implications to existing arrangements of each option identified and the steps needed to implement each option – June 2017

Assessment & Design fees – supporting BEIS

- BEIS published call for evidence 24 March 2016
- Sought responses by 6 May 2016

  https://www.gov.uk/government/consultations/assessment-and-design-fees-call-for-evidence
- In summary
  - DNOs should charge the customers requesting the service to create a fairer allocation of costs
  - Following the call for evidence BEIS has been working on its impact assessment and we have provided additional connections data
  - BEIS plan to consult in early 2017 on draft regulations

A smart, flexible energy system

- BEIS and Ofgem published a joint call for evidence on 10 November 2016
- It requests responses by 12 January 2017

  https://www.ofgem.gov.uk/system/files/docs/2016/11/a_smart_flexible_energy_system_a_call_for_evidence.pdf
- In summary
  - Greater clarity needed on how storage connects to the network
  - Charging methodologies may not accurately reflect the value and costs of storage
  - Network charges: Ofgem to undertake a targeted review which will include looking at a fair recovery of the sunk costs of the networks in the context of increased self-consumption from rooftop solar and storage
  - Ofgem working though the Council of European Energy Regulators (CEER) to develop high level principles for distribution charging going forward
  - “In the immediate term, DNOs need to transition to DSOs” and to significantly increase engagement with the transmission system operator to deliver the best whole system outcomes for customers

Sponsoring the Northern Energy Taskforce

- An ambitious programme of work over the next 18 months that will develop an energy strategy for the northern powerhouse:
  - ✓ Develop a plan for the northern energy system to 2030
  - ✓ Create a vision and a roadmap for a northern energy system
  - ✓ Set out a plan for 'energy devolution'

NORTHERN ENERGY TASKFORCE

IPPR North call for evidence closing January 2017

http://www.ippr.org/publications/northern-energy-taskforce-a-call-for-evidence

Northern Energy Taskforce – round tables

Roundtable	Topics (provisional/subject to change)
Tees Valley	**Energy supply** - What is the future of energy supply in the North? What are the impacts of this for businesses and residents?
North East	**Research and development** - How to develop research in the North and ensure products get to market
Yorkshire & Humber	**Supply chain** - How to develop the jobs and GVA associated with energy generation and align other core northern industries to supply domestic and international energy markets
North West	**Finance** - How to finance an energy strategy for the North
Yorkshire & Humber	**Decentralised energy** - Examining the opportunities for the north presented by the transition to localised power and heat systems. Thinking about strategic ways of working in this transition
Manchester	**Devolution** - How to ensure the North has the powers it needs to implement a northern energy strategy

Acting on your Feedback

Emma Wilson

ICE & Connections Stakeholder Advisor

Incentive on Connections Engagement

- The Incentive on Connections Engagement (ICE) drives DNOs to continually improve services to major connections customers
- Each year we produce a detailed work plan of service improvement actions
- Our work plans are developed together with our connections stakeholders and customers, all actions are based on their feedback and ideas

Channels for engagement

STAKEHOLDER PANEL

CONNECTIONS
CUSTOMER FORUMS

MONTHLY
CUSTOMER
AND ICP
SURGERIES

enquiries via our
CONNECTIONS
CALL CENTRE

STAKEHOLDER
NEWSLETTERS

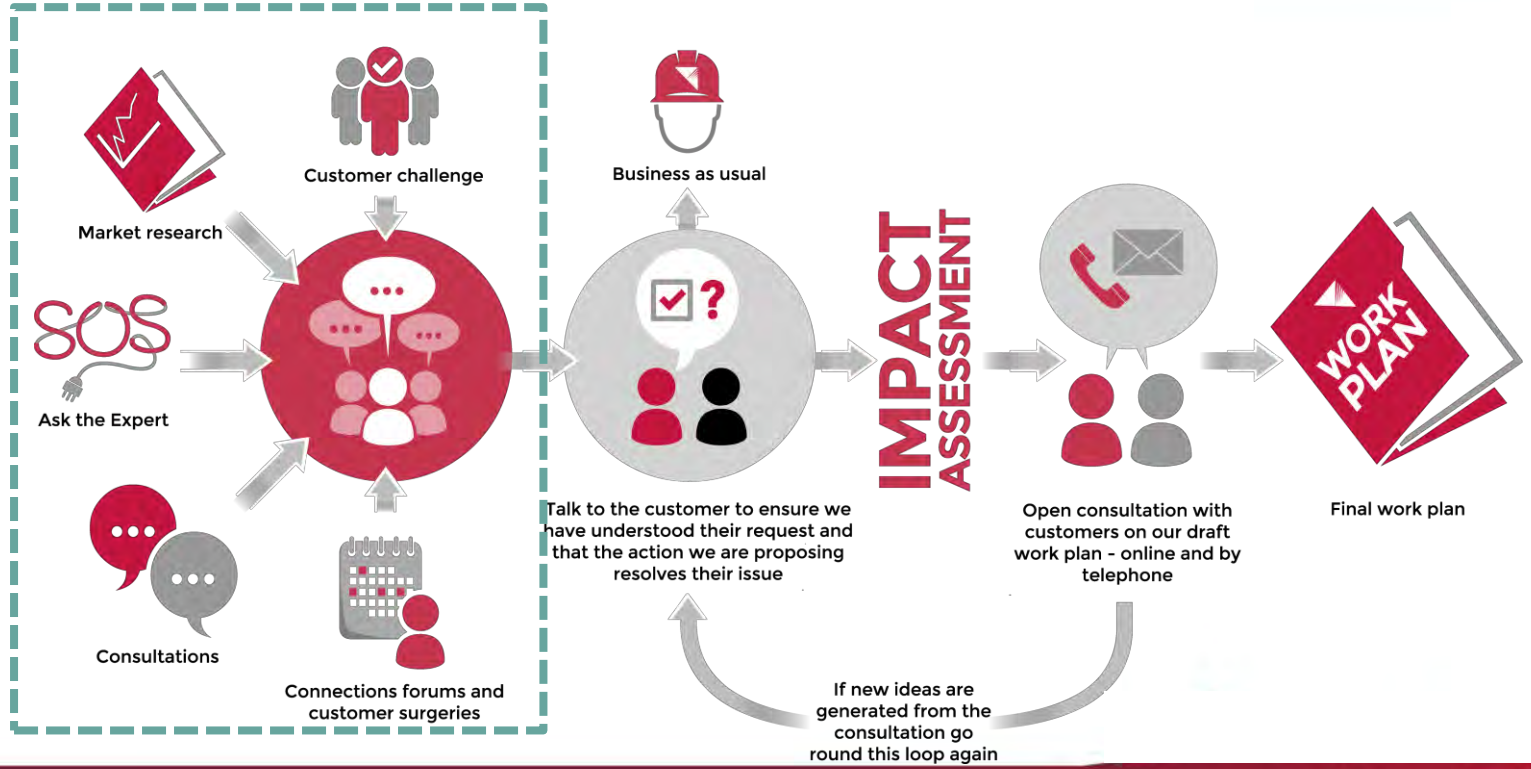
Formal stakeholder
consultations

telephone
MARKET
RESEARCH
interviews

FACE TO FACE
DISCUSSIONS

ASK THE
EXPERT
ENQUIRIES

Developing our improvement plans



Work plan update

22 2016-17

72 2015-16

Work plan update

31

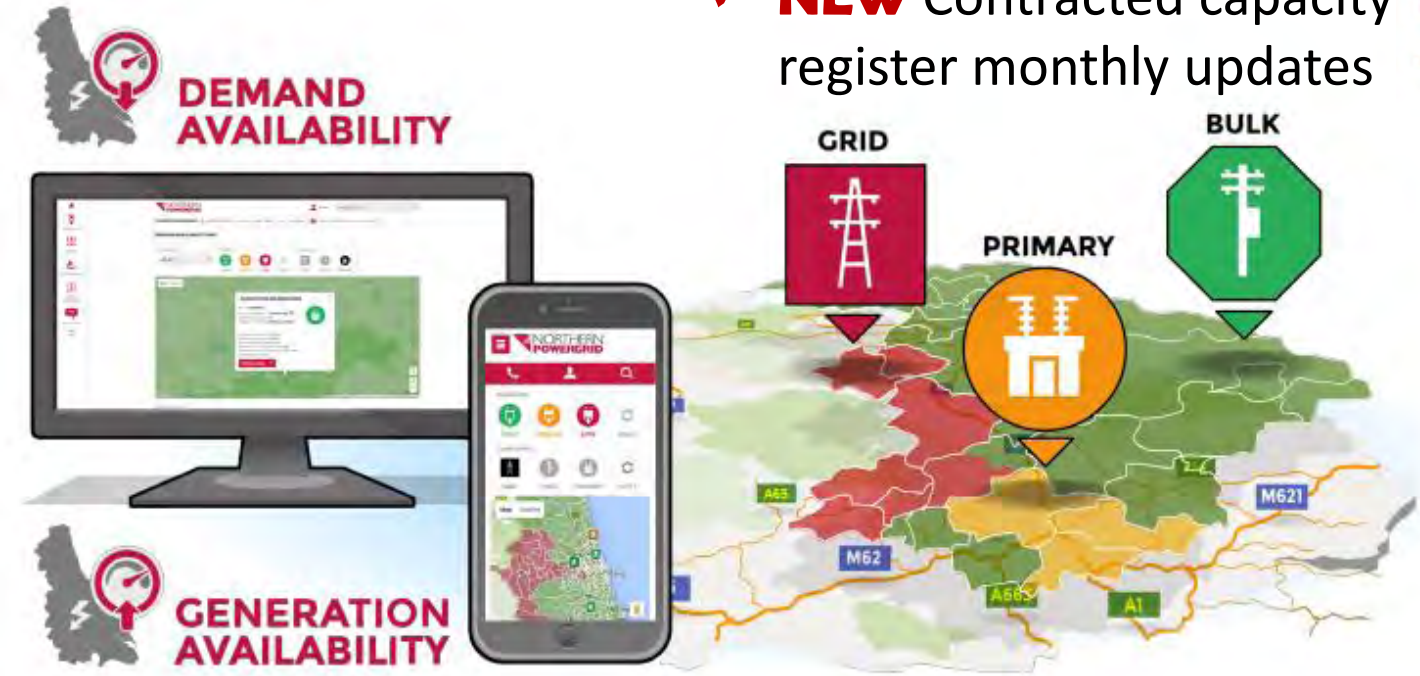
OCT 2016-17

72

2015-16

Acting on your feedback

- ✓ Monthly data refreshes
- ✓ **NEW** Contracted capacity register monthly updates



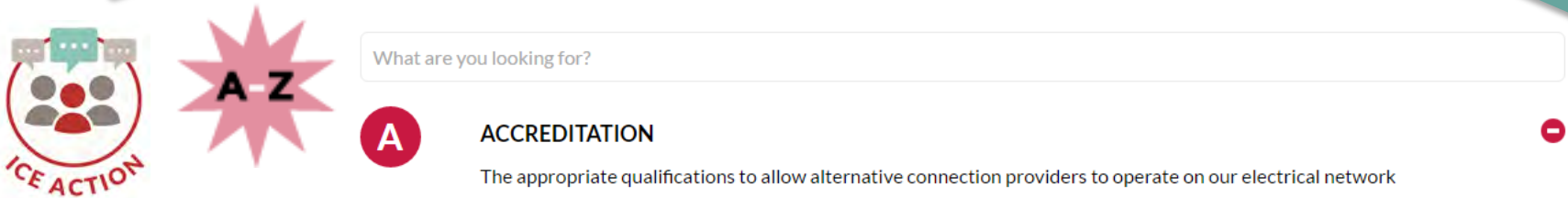
Acting on your feedback

You said:

"The plan seems fairly thorough; it's just that there is a lot of technical jargon used that is not explained"

We did:

✓ **NEW** We launched an online jargon buster to help customers understand technical terminology and acronyms



Acting on your feedback

You said:
"PoC self-determination. Could an info or demo day be put in place to go through the processes? Other DNOs have done so"

ICE ACTION

We did:

✓ **NEW** ICP self-determination point of connection workshop in quarter 1, 2017

Acting on your feedback

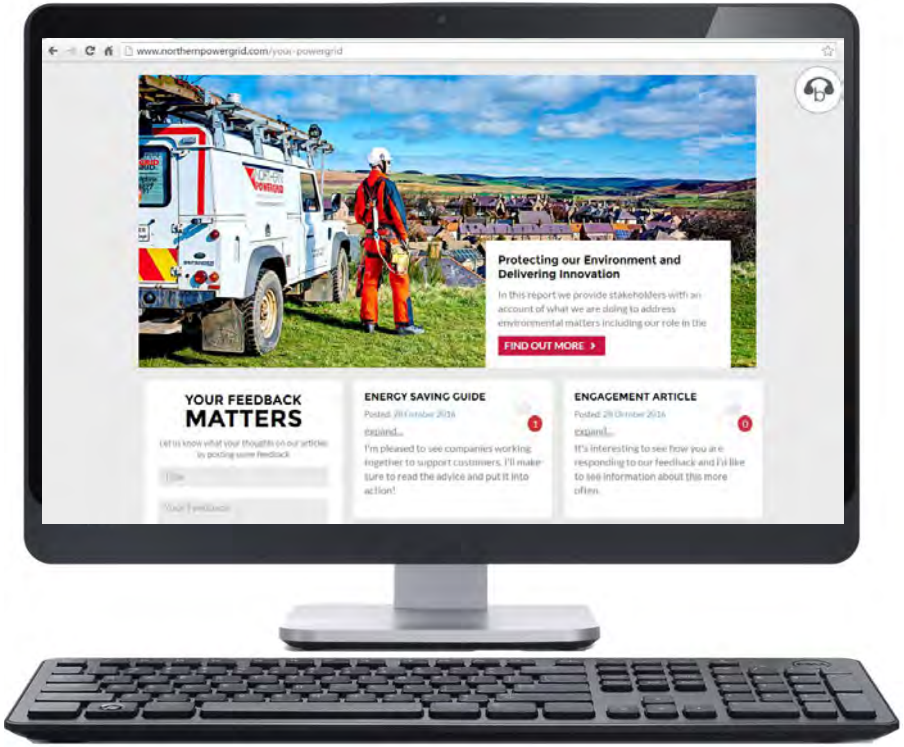
You said:

"As per last year, I would have supported a continued commitment to improve communication of transmission issues and to improve the support to customers through the process"

We did:

✓ **NEW** We made a commitment to support the national working party on transmission processes and adopt best practice process outcomes

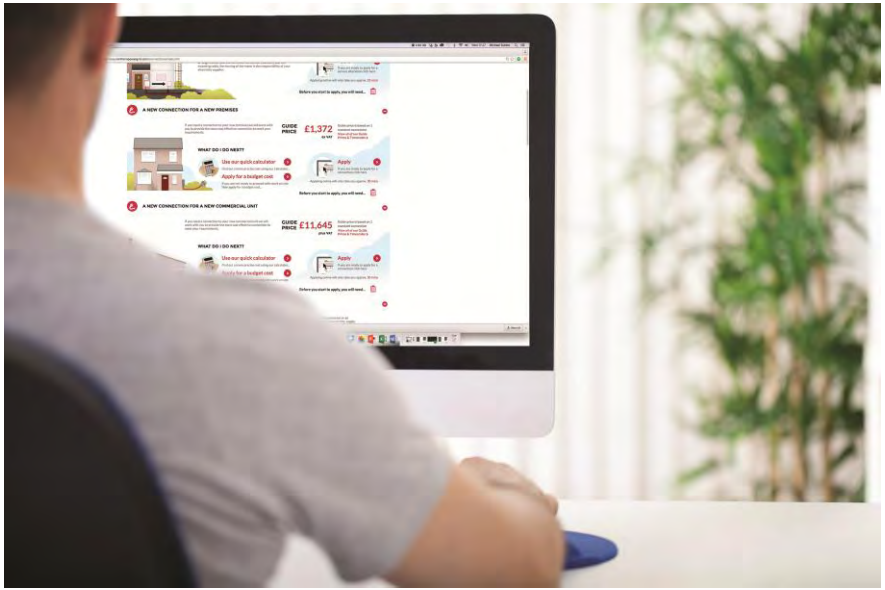
Your feedback matters



- ✓ **NEW** We have launched a new stakeholder section of our website called Your Powergrid
- ✓ We're also looking for your feedback on how we can improve your overall digital experience

Other resources

- Connections website www.northernpowegrid.com/getconnected
- Incentive on Connections Engagement (ICE) web page www.northernpowergrid.com/incentive-connections-engagement



In summary

- We have listened to the feedback you have given us and are now looking at how we can address it
- We need you to continue to tell us about the issues you are encountering and how we can help
- Your views will be acknowledged, considered and responded to as part of our ongoing stakeholder engagement process

Queue Management

Mark Johnston

Operations Manager

QMEC background

- Stakeholders have voiced concerns over the efficiency and delivery of connections
- Concerns focused on costs and delays imposed as a consequence of lack of capacity
- In 2015 Ofgem responded by sending an open letter and holding a workshop seeking to identify solutions
- There were over 50 responses to the consultation and in September 2015 Ofgem issued a ‘next steps’ document
- The document provided a summary of actions to improve the current process
- DNOs were given until the end of December to identify possible solutions and update Ofgem on progress

Quicker More Efficient Connections

Ofgem requested development of regimes to withdraw capacity from customers where it is not being used

Does a customer requested change impact on their queue position?	Develop ‘best practice’ milestones in connection offers	Introduce a time limit to ‘build out’ once connected	Seek reductions from existing customers using <75% capacity	Investigate use of diversity factor when assessing peak export capacity
Material changes	Construction milestones	Build out timescales	Unused capacity	Diversity

Reduce the need for reinforcement by managing connections offers

- One strand work that Ofgem asked the DNOs to consider was the use of ‘milestones’ in offers
- The majority of respondents had supported using milestones in connection offer contracts, with enforcement of milestones when no reasonable evidence of progress is provided
- Ofgem supported this view stating they believed that connection customers in general would benefit from a regime which allowed capacity that has previously been issued to be withdrawn if there was little prospect of it being used:

> *“We want the DNO-DG steering group to develop the principles and rules that will apply to using milestones in connection offers. The DNO-DG steering group should provide high-level principles to us by December 2015. These principles will be subject to wider consultation with stakeholders before they are implemented”*

Overview of progress

Dec	• High level principles sent to Ofgem
March	• Issued consultation (1 April 2016) with 6 week consultation period
May	• Consultation closed 13 May 2016
June	• Initial review of responses at DG-DNO Steering Group
July	• Detailed review of comments
Aug	• Revised draft completed
Sept	• Output reviewed at DG-DNO Fora
Nov	• Document published 3 November 2016

Milestone principles

The consultation document put forward seven high level principles:

1. In general, early milestones, particularly milestones before a project has achieved planning consent, will be enforced more rigidly
2. Milestones will be introduced consistently. There will be no single milestone relating to funding progression
3. If a customer misses a milestone the DNO will contact the customer before terminating to give them the opportunity to discuss and evidence any progression
4. Milestones should be spaced out across the timescales for the project and, where possible, there should be a maximum of one year between milestones
5. The DG customer will need to demonstrate that it has tried to make progress (assessed against the evidence outlined in the milestones tables) and demonstrate that delays are no fault of their own
6. Milestones and associated specific time periods should be appropriate to the size and technology type of generation and voltage level of connection
7. Individual DNOs may choose to apply less than all of the milestones above to certain specific groups of customers

Milestones

Initiate planning	• 2 months from offer acceptance date - submission of planning application OR Environmental Impact Assessment (EIA) has started • If EIA needed then 14 months
Secure planning	• Planning permission granted – 12 months if you don't require EIA or 24 months if you do require one
Land rights	• 2 months from offer acceptance date, with a further 2 months from date of expiry of the land rights
TSO interface	• The customer is required to initiate and continue to progress the relevant TSO process in good faith.
Contestable works design submissions	• To be agreed with the customer, normally working back from connection date but no earlier than the date of planning consent
Commence works	• As set out in the construction plan which will be agreed with the DNO and usually provided 6 months following the granting of planning permission
Construction of generating facility	• Set on a case by case basis according to construction plan

Quicker More Efficient Connections

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Releasing spare capacity

- 86 large generators are using less than 75% of their contracted capacity
- Working closely with our customers we have:
  - Released 3MW of generation capacity and 28MW of demand capacity
  - Terminated dormant quotations to release 256 MW of committed generation capacity

Protection Policy Update

Jim Paine

Protection & Technical Services Manager

Recent changes to protection policy

- Was DSS/007/001
- Now IMP/001/014
- Policy for the Protection of Distribution Networks

Drivers for change

- **Developments in technology**
  - Introduction of load blinding directional overcurrent protection
  - Use of digital signal channels such as fibre since the last review

Drivers for change

- Comments and feedback from customers
- The policy was based on G59/2 2010 (now G59/3-2 2015) [Recommendation for the connection of generating plant to the distribution system of licensed distribution network operators]

Witness testing

- The requirements for witness testing of generation connections has been reviewed
- The policy has not been changed other than to align documentation and site test requirements to G59/3-2 2015

Generator interface protection

- The most significant changes have been to the section covering generator interface protection
- First a summary of our old policy associated with generator interface protection

Old generator interface protection

- Northern Powergrid fitted interface protection if a generator rating was over 200kVA, subject to a trapped load assessment
- Above 1MVA and below 5MVA a risk assessment determined the use of an NVD relay or inter-tripping
- Above 5MVA or 20kV inter-tripping was always fitted

Generator interface protection

- For all synchronous machines above 200kVA Northern Powergrid interface protection will be fitted subject to a minimum trapped load assessment

Generator interface protection

- For all generators based on technology other than synchronous machines no Northern Powergrid interface protection will be fitted to generator connections of less than 5MVA
- Exception is if they have a direct connection back to a HV busbar that they can support on a minimum load assessment

Generator interface protection

- Fixed power quality logging equipment will be installed at interface substations for all generators above 200kVA, remote communication facilities will be provided via a mobile data network

Generator interface protection

- Unless requested by the customer loss of mains inter-tripping schemes will not be fitted to connections of less than 50MVA
- Where loss of mains inter-tripping schemes are fitted at the request of the customer they will not normally extend more than one voltage level above the point of connection voltage

Updated protection policy document

- The updated policy document IMP/001/014 is available on our website in the document library section
- The generation requirements are in section 3.4 of the document

Technical Innovation

David van Kesteren

Senior Asset Management Engineer

Flexible connections & storage

- What is a flexible connection?
- Export limiting schemes
- Active Network Management
- Storage technology

What is a flexible connection?

- If you are able to vary your import or export requirements on an agreed basis, then a flexible connection might be beneficial

Traditional connection	Flexible connection
• Fixed capacity	• Variable capacity
• Can use it any time	• Fixed operating times
• Independent of network conditions	• Dependent on network conditions
• Independent of other customers	• Dependent on other customers' usage

Is it for me?

- Does it fit your business model?
- Can you defer or delay your processes?

Customer benefits	Customer risks
• Avoid local or wider reinforcement costs when you initially connect	• Your import or export capacity will sometimes be limited
• Get connected to the network before reinforcement works have been carried out	• The frequency of the constraint may change over time
	• The cost of a traditional connection might increase if/when you choose to upgrade later on

Export limiting schemes

- Solutions for generators where there is limited export capacity on the DNO network
- Currently used for customer energy management
- Customer's controller diverts generated power into a load to avoid or limit export
  - Hot water immersion heater
  - Battery storage system
- Generator reduces output / turns off to ensure export agreement is not exceeded
- Can be set for zero export if required
- Not historically permitted for DNO export constraints

Export limiting schemes – now permitted

- New national Engineering Recommendation G100
- Northern Powergrid internal Code of Practice to mirror G100
- Contains a functional specification for scheme requirements
- Customer responsible for proof of design and installation
- Total generation limited to 125% of import or export agreement
- Default export capacity for LV connections 16A per phase
- G59 application still required

Total generator size	Witnessed testing?
<50kW	Not required
50-200kW	Discretionary
>200kW	Compulsory

Active Network Management - Driffield

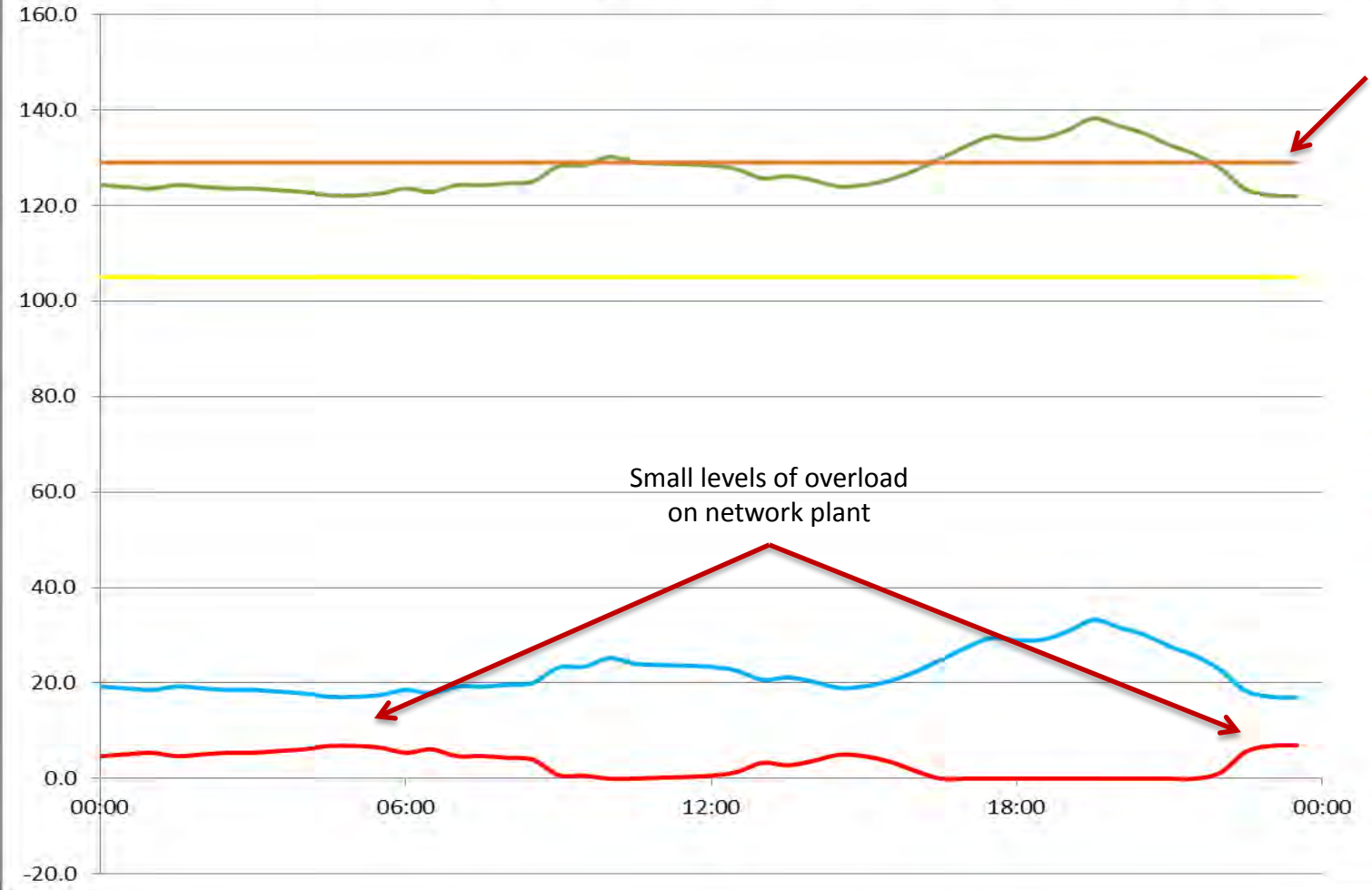
Current contracted HV/EHV generation capacity	129MW
Network export capacity	105MW
Network minimum demand	17MW
Overall generation capacity at minimum demand	122MW
Maximum demand	114MW
Theoretical generation capacity at maximum demand	236MW

Conventional limit for generation

Additional headroom can only be accessed by managing the output from generation

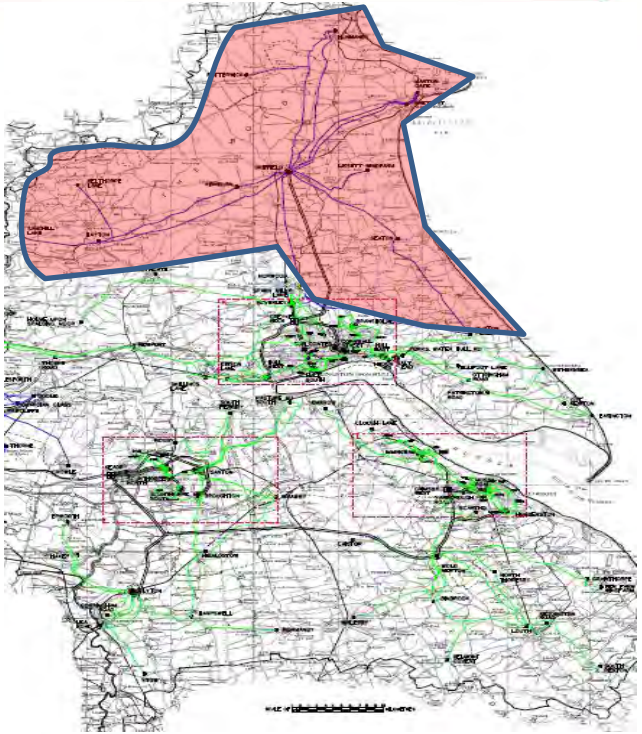
- Exceeding the conventional limit for connected generation may lead to network plant being overloaded
- Network minimum demand can reduce or increase over time

Plant overload example - existing & contracted generation



Active Network Management

- Driffield network in development
- 129MW of generation in the group
- Network full at key times
  - Early summer mornings
  - Network outages
- Real-time allocation of network capacity
- ANM will release headroom outside of key periods
- Constraints impact on lower voltages
- Current max generator 200kVA
- Estimated curtailment
  - Wind 3% reduction in load factor
  - Solar to be confirmed
- Last In First Off principles



Energy storage systems

- Systems capable of storing electrical energy and then releasing it back in a controlled manner
- Requires both import and export capability (i.e. it is a load and a generator) to charge and discharge the system
  - Batteries
  - Pumped hydro
  - Flywheel

Domestic / small scale applications

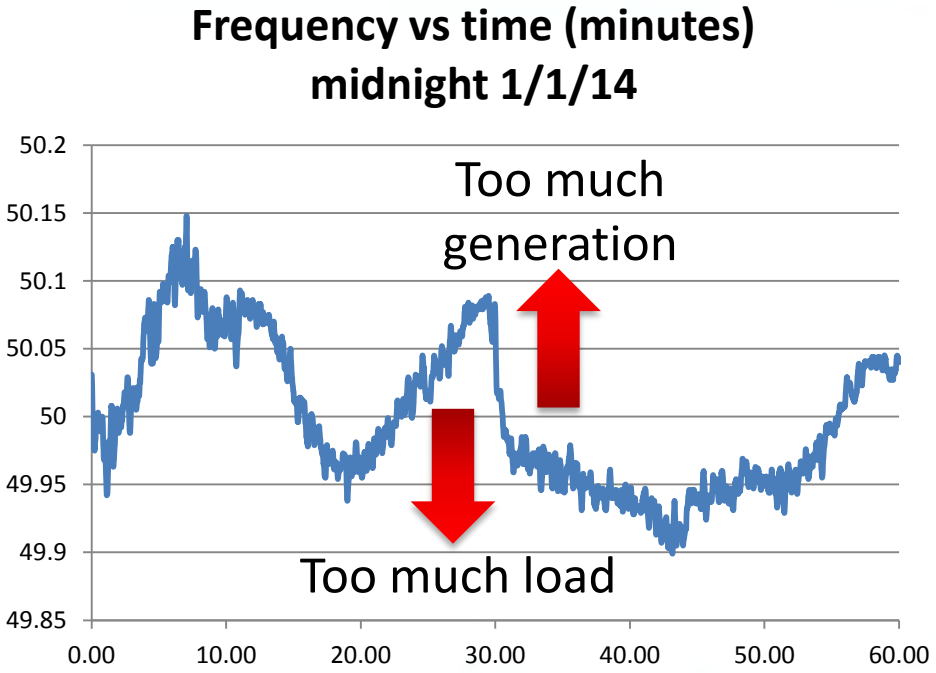
- Battery storage is the developing market
- Applicable at domestic and commercial level
- Typically used to offset rooftop solar installations
  - Reduces exported power at midday, by charging battery
  - Reduces imported power at tea-time, by discharging battery
  - Reduces annual electricity bills
  - Need to consider initial capital cost and life expectancy
  - Works well within an export limiting scheme
- If the total generation capacity (solar + battery) exceeds 3.68kW then requires a G59 (large scale generation) application

Large scale applications

- Battery storage is the emerging market
  - Some historical pumped hydro schemes
- Generally offering network balancing services to National Grid
  - Enhanced or firm frequency response (EFR/FFR)
  - Peak network load support (capacity auctions / STOR)
- Enquiries vary from 1MW up to 100MW
- Trend towards larger installations
- Very low acceptance rates

National Grid and frequency response

- UK supply balanced through frequency response
- Big generators automatically respond to frequency
  - Primary response is approx. 10s
- Mechanical inertia is high
  - Rides the first 10s
  - Good for overall stability
- Wind and solar have low inertia
  - Frequency drops quicker
  - Poor for stability



Applying for storage

- If the combined maximum capacity of the system is less than 3.68kW (for a single phase domestic or small commercial customer) then fit and notify Northern Powergrid via your installer:

Application Process	Type of installation
G.83 fit and notify	Battery only <3.68kW
	Battery and solar panels, combined capacity <3.68kW
	Battery and solar panels combined capacity >3.68kW, but sharing a single inverter of capacity <3.68kW
G.59 application (large scale generation)	All other installations, including when an export limiting scheme is used to control export

How to apply

- G.59 application form:

https://www.northernpowergrid.com/asset/0/document/2663.pdf

- Information on energy storage systems:

http://www.northernpowergrid.com/energy-storage-projects

- Northern Powergrid guidance on the G.83 notification process:

https://www.northernpowergrid.com/downloads/2312

- National G.83 guidance document:

http://www.northernpowergrid.com/asset/0/document/315.pdf

Workshop objectives and desired outcomes

- Update you on the service improvements we have been making
- Hear about the issues you are facing and what we can do to help
- Give you an opportunity to shape our future improvement plans

Closing Remarks

Jim Cardwell

Head of Trading and Innovation